LEACH
CORPORATION
CONTROLS DIVISION

LEACH SATELLITE TAPE RECORDERS·SERIES 2000

MINIATURE • TWO CHANNEL • LIGHTWEIGHT
HERMETICALLY SEALED • NUCLEAR RESISTANT

ENVIRONMENTAL SPECIFICATIONS

MECHANICAL SPECIFICATIONS

LEACH MODEL	VIBRATION, SHOCK, ACCELERATION	TEMPERATURE	HUMIDITY	RELIABILITY MTBF*	NUCLEAR ENVIRONMENT	SIZE	WEIGHT	VOLUME	TAPE SPEED†	RECORD/ REPRODUCE SPEED RATIO
2100	Unit capable of survival (non-operating) during missile launch and is operational during orbit phase.	−30°F to +110°F	100% R.H. (hermetically sealed case)	2,000 hrs.	not applicable	4.687″x 7.000″x 7.500″	7.5 lbs.	246 cubic inches	1.8 ips—record, 46.8 ips—reproduce	1:26
2200		−30°F to +165°F	100% R.H. (hermetically sealed case)	10,000 hrs.	Capable of operation both during and after radiation exposure of $1x10^{13}$ neutrons per cm^2 and $1x10^8$ carbon rads	5.875″x 7.000″x 7.500″	10.5 lbs.	304 cubic inches	3.75 ips—record, 48.75 ips—reproduce	1:13
2201		0°F to +165°F	100% R.H. (hermetically sealed case)	12,000 hrs.	Capable of operation during and after radiation exposure of $5x10^{11}$ neutrons per cm^2 and $5x10^5$ carbon rads	5.250″x 7.000″x 7.500″	10 lbs.	271 cubic inches	1.95 ips—record, 23.4 ips, reproduce	1:12
2202		0°F to +165°F	100% R.H. (hermetically sealed case)	12,000 hrs.	not applicable	5.250″x 7.000″x 7.500″	10 lbs.	271 cubic inches	0.9 ips—record, 23.4 ips—reproduce	1:26
2203		0°F to +165°F	100% R.H. (hermetically sealed case)	12,000 hrs.	not applicable	5.250″x 7.000″x 7.500″	10 lbs.	271 cubic inches	15.0 ips—record, 30.0 ips—reproduce	1:2
2204		0°F to +165°F	100% R.H. (hermetically sealed case)	12,000 hrs.	not applicable	5.250″x 7.000″x 7.500″	10 lbs.	271 cubic inches	7.5 ips—record, 30.0 ips—reproduce	1:4
2205		0°F to +165°F	100% R.H. (hermetically sealed case)	12,000 hrs.	not applicable	5.250″x 7.000″x 7.500″	10 lbs.	271 cubic inches	1.95 ips—record, 23.4 ips—reproduce	1:12

*MTBF data shown is for 100% duty cycle. Probability of survival for 1,000 hrs. is 92.3% or greater, depending on model. Shelf life — 1 yr. min.

†±0.5% long term speed stability

ELECTRICAL SPECIFICATIONS

WOW & FLUTTER	TAPE CAPACITY* (MAXIMUM)	RECORD TIME (MAXIMUM)	REPRODUCE TIME (MAXIMUM)	MAGNETIC HEAD STACKS	NUMBER OF TRACKS	START UP TIME‡‡	REVERSE TIME	POWER REQUIREMENTS	POWER DRAIN†† (MAXIMUM)	CONTROL LOGIC	RECORD/ REPRODUCE ELECTRONICS*	RECORD/ REPRODUCE RATIO
2%‡	2100 ft.	233 mins.	9.0 mins.	1**	2	15 sec.	10 sec.	22 to 29.25 vdc isolated ground	4 watts-record; 10 watts-reproduce @ 77°F	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.	2 channels FM	1:26
3%‡	1277 ft.	136 mins.	10.5 mins.	2**	4 (2 forward— 2 reverse)	4 sec.	2 sec.	22 to 29.25 vdc isolated ground	13.5 watts-record; 20 watts-reproduce	2 steady state 22 vdc (min.) commands necessary for record and reproduce modes. Stop mode obtained when power is removed.★	2 channels FM	1:13
3%‡	2100 ft.	215 mins.	17.9 mins.	2**	2	5 sec.	5 sec.	22 to 29.25 vdc isolated ground	5 watts-record; 8 watts-reproduce	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.	2 channels FM	1:12
3%‡	1277 ft.	284 mins.	10.9 mins.	2**	2	5 sec.	5 sec.	22 to 29.25 vdc isolated ground	5 watts-record; 8 watts-reproduce	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.★★	2 channels FM	1:26
2% pp DC to 5 KC max.	1277 ft.	17 mins.	8.5 mins.	3	2	5 sec.	5 sec.	22 to 29.25 vdc isolated ground	8 watts-record; 10 watts-reproduce	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.	2 channels analog	1:2
2%‡	1277 ft.	34 mins.	8.5 mins.	3	2	5 sec.	5 sec.	22 to 29.25 vdc isolated ground	8 watts-record; 10 watts-reproduce	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.	1 channel FM & 1 channel analog	1:4
3%‡	2100 ft.	215 mins.	17.9 mins.	2**	2	5 sec.	5 sec.	22 to 29.25 vdc isolated ground	5 watts-record; 8 watts-reproduce	3 momentary 22 vdc (min.) commands necessary for record, reproduce and stop modes.	2 channels FM	1:12

‡Expressed in % peak-to-peak maximum for record and playback over data frequency range.

*plus end-of-tape sensing based on ¼" wide, 1.08 mil tensilized mylar

** Provision for 3 separate head stacks

‡‡Regardless of previous mode of operation.

††at 28 vdc

★Model 2200 provides continuous recording or reproducing by automatically reversing direction when the end-of-tape sensors are contacted.

★★Model 2202 automatically reverts to record mode at end of reproduce mode.

*Will accommodate 2 a channels by increasin (depth) weight & powe

ELECTRONIC SPECIFICATIONS

INPUT IMPEDANCE (OPERATING OR NON-OPERATING)	SIGNAL INPUT LEVEL	OUTPUT IMPEDANCE	RECORD FREQUENCY RANGE	REPRODUCE FREQUENCY RESPONSE	SIGNAL OUTPUT LEVEL	SYSTEM NOISE LEVEL	MAXIMUM DISTORTION	REFERENCE OSCILLATOR	RISE & FALL TIME BETWEEN 10% & 90% AMPLITUDE LEVELS	OVERSHOOT & UNDERSHOOT (MAXIMUM)	LINEARITY	LEACH MODEL
200 K ohms minimum	0 to 5.3 vdc	10 K ohms maximum	DC to 30 cps square wave or DC to 150 cps sine wave	DC to 780 cps square wave or DC to 3900 cps sine wave	0 to 5.3 ±0.2 vdc	30 db below full scale reproduce level	2% over the reproduce frequency range	Not applicable	Less than 100 micro sec.	±10% of output signal at 4 v peak-to-peak	output equals input ±0.2 vdc from 0 to 5.0 vdc	**2100**
250 K ohms minimum	0 to 5.3 vdc	1 K ohm maximum	DC to 128 cps square wave or DC to 1 KC sine wave	DC to 1664 cps square wave or DC to 13 KC sine wave	0 to 5.3 ±0.2 vdc	30 db below full scale reproduce level	2% over the reproduce frequency range	Not applicable	Less than 30 micro sec.	±5% of output signal at 5 v peak-to-peak	output equals input ±0.2 vdc from 0 to 5.0 vdc	**2200**
250 K ohms minimum	0 to 5.3 vdc	1 K ohm maximum	DC to 65 cps square wave or DC to 325 cps sine wave	DC to 780 cps square wave or DC to 3900 cps sine wave	0 to 5.3 ±0.2 vdc	30 db below full scale reproduce level	2% over the reproduce frequency range	Not applicable	Less than 100 micro sec.	±5% of output signal at 4 v peak-to-peak	output equals input ±0.2 vdc from 0 to 5.0 vdc	**2201**
250 K ohms minimum	0 to 5.3 vdc	1 K ohm maximum	DC to 30 cps square wave or DC to 150 cps sine wave	DC to 780 cps square wave or DC to 3900 cps sine wave	0 to 5.3 ±0.2 vdc	30 db below full scale reproduce level	2% over the reproduce frequency range	Not applicable	Less than 100 micro sec.	±5% of output signal at 4 v peak-to-peak	output equals input ±0.2 vdc from 0 to 5.0 vdc	**2202**
250 K ohms minimum	1 v rms	1 K ohm maximum	200 cps to 55 KC sine wave	400 cps to 110 KC sine wave	1 v rms	30 db below full scale reproduce level	3% at 1 KC reproduce frequency	50 KC • ±0.25%	Not applicable	Not applicable	Not applicable	**2203**
250 K ohms minimum	0 to 5.3 vdc FM; 1 v rms analog	1 K ohm max. FM; 500 ohms ±20% at 1 KC analog	DC to 30 cps square wave FM; 200 cps to 10 KC sine wave analog	DC to 120 cps square wave FM; 800 cps to 40 KC sine wave analog	0 to 5.3 ±0.2 vdc FM; 1 v rms analog	30 db below full scale reproduce level	3% at 1 KC reproduce analog; 2% over the reproduce frequency range FM.	Not applicable	Less than 100 micro sec. FM channel	±5% of output signal at 4 v peak-to-peak FM channel	output equals input ±0.2 vdc from 0 to 5.0 vdc FM channel	**2204**
250 K ohms minimum	0 to 5.3 vdc	1 K ohm maximum	DC to 65 cps square wave or DC to 325 cps sine wave	DC to 780 cps square wave or DC to 3900 cps sine wave	0 to 5.3 ±0.2 vdc	30 db below full scale reproduce level	2% over the reproduce frequency range	Not applicable	Less than 100 micro sec.	±5% of output signal at 4 v peak-to-peak	output equals input ±0.2 vdc from 0 to 5.0 vdc	**2205**

• linearly mixed with one data channel for wow & flutter compensation

ditional
size

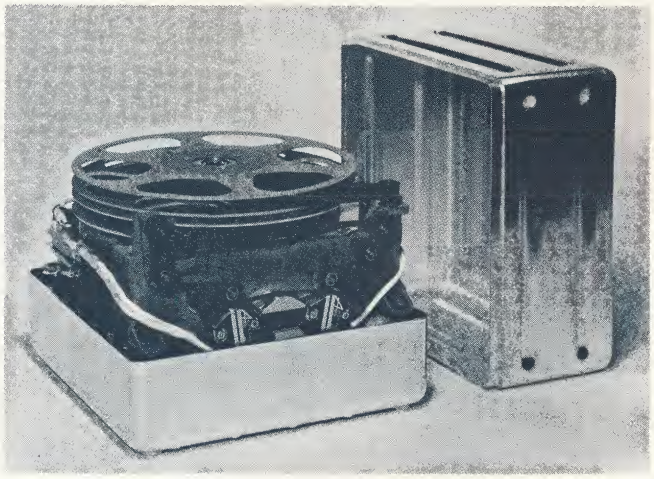
LEACH CONTROLS DIVISION

LEADERS IN DATA RECORDING FOR SATELLITE AND SPACE PROBE APPLICATIONS

Leach Controls Division, specialists in magnetic tape recording, devote their research, design and manufacturing talents to meeting the challenges of the space industry. Consistently they have led in the development of recording equipment and systems that are:

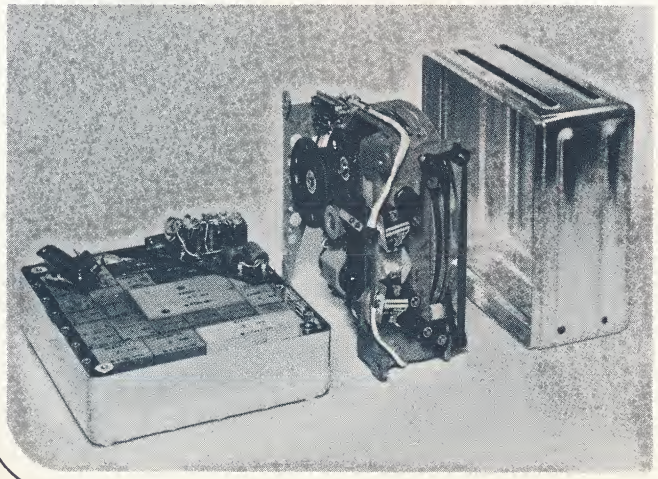
- smallest in size
- lightest in weight
- lowest in power consumption
- highest in reliability
- maximum data storage capacity

The Leach Satellite Tape Recorders described in this brochure have proved highly reliable, not only under stringent test procedures, but in actual flight conditions. Today, many are in orbit, recording, storing and playing back valuable information—when and where needed.



Satellite Tape Recorder 2100 showing hermetically sealed assembly

Below: Open-view of recorder showing modular electronic packaging



NOTE THESE OUTSTANDING CHARACTERISTICS OF SERIES 2000 SATELLITE TAPE RECORDERS

STANDARD

Model 2100 . . . . . two channels FM data; 233 minutes maximum record time; 1:26 record/reproduce speed ratio; fully qualified to military specifications.

NUCLEAR HARDENED

Model 2200 . . . . . *(90% probability of survival for 1,000 hours of continuous operation in an orbital environment; MTBF of 10,000 hrs.).* fully tested for reliable operation after radiation exposure of 1×10^{13} neutrons per cm^2 and 1×10^8 carbon rads; provides 2 channels FM data; 136 minutes maximum record time; 1:13 record/reproduce speed ratio.

Model 2201 . . . . . *(92% probability of survival for 1,000 hours of continuous operation in an orbital environment; MTBF of 12,000 hrs.).* fully tested for reliable operation after radiation exposure of 5×10^{11} neutrons per cm^2 and 5×10^6 carbon rads; provides 2 channels FM data; 215 minutes maximum record time; 1:12 record/reproduce speed ratio.

HIGH RELIABILITY

(92% probability of survival for 1,000 hours of continuous operation in an orbital environment; MTBF of 12,000 hrs.).

Model 2202 . . . . . two channels FM data; maximum record time 284 minutes; 1:26 record/reproduce speed ratio.

Model 2203 . . . . . two channels analog data; 17 minutes maximum record time; 1:2 record/reproduce speed ratio.

Model 2204 . . . . . one channel FM data and one channel analog data; 34 minutes maximum record time; 1:4 record/reproduce speed ratio.

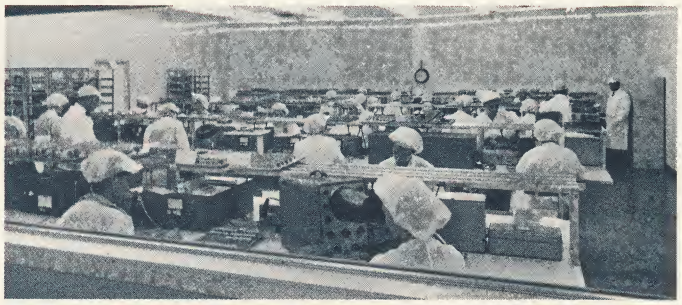
Model 2205 . . . . . two channels FM data; 215 minutes maximum record time; 1:12 record/reproduce speed ratio.

SEE CHARTS INSIDE FOR COMPLETE SPECIFICATIONS AND BROAD RANGE OF CAPABILITIES AVAILABLE TO YOU.

LEACH SATELLITE RECORDERS

DESIGNED, MANUFACTURED AND TESTED IN ONE OF AMERICA'S MOST MODERN ELECTRONIC FACILITIES

Leach Controls Division Facility, Azusa, California

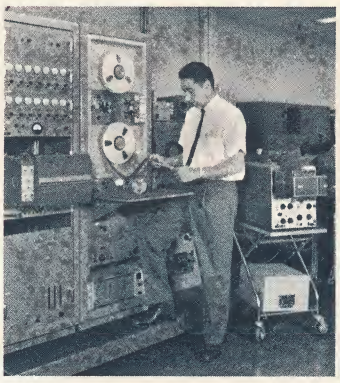


"White room" for the ultimate in contaminant-free assembly

The Leach Controls Division is geared to undertake the development and production of custom-designed electronic systems and equipment. The all-new air conditioned plant at Azusa, California provides 42,000-feet of fully equipped engineering and manufacturing facilities.

The ultimate assembly area is contained in a 12,000 sq. ft. "white room" where an elaborate temperature, humidity and electronic dust control system assures a constant level of ideal environmental conditions. The division's engineering laboratory is the most modern in the industry. Its environmental laboratory includes three separate chambers for simultaneous testing to rigid specifications of temperature, altitude and humidity. A complete random noise, sine wave and vibration test system was specifically designed for the needs of this test installation.

Precision assembly area



Testing of Leach Tape Recorder on special ground playback equipment

Shock testing of recorder in environmental laboratory

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For further information on Leach Satellite Tape Recorders or other data recording equipment to meet your specific application requirements, contact your nearest Leach District Sales office or the main plant.

LEACH
CORPORATION
CONTROLS DIVISION

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